Abstracts

An Optical Waveguide with the Optimum Distribution of the Refractive Index with Reference to Waveform Distortion

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The group velocities of different modes are not the same when a usual type of optical waveguide is considered. The envelope of an optical pulse is therefore broadened while the optical pulse travels. In the case of a two-dimensional waveguide, it is found that the group velocity of each mode can be made the same if an appropriate distribution of the refractive index in the guide is realized. When a waveguide with such an optimum distribution is considered, the group velocity is also independent of frequencies if the medium is dispersion free. The property mentioned above is closely related to the fact that such a waveguide has an ideal focusing property. In the case of a cylindrical optical waveguide in which the refractive index depends only on the radius, such an optimum distribution does not exist. A method of calculating the mean velocity of an arbitrary ray in the guide is described on the basis of the WKB approximation to the wave equation.

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